PATENT ABSTRACTS OF JAPAN

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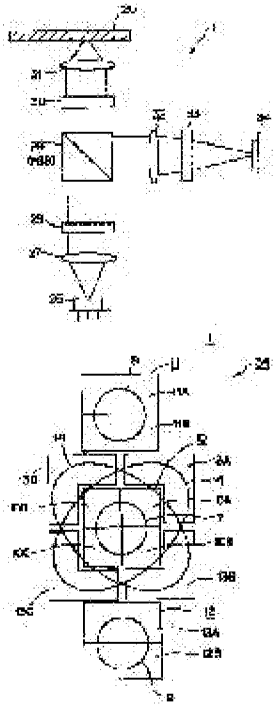
(54) OPTICAL PICKUP DEVICE FOR MULTILAYERED OPTICAL DISK



(57)Abstract:
PURPOSE: To speed up the correction of focal position and to rapidly read/ reproduce a required information signal by generating astigmatism in a beam reflected on an information signal layer of a multilayered optical disk.
CONSTITUTION: When the information signal is read/reproduced from a first signal layer of a double-layered optical disk 20, an optical path of a laser beam from a laser diode 26 and the focused signal layer of the disk 2020 are detected. In such a case, respective reflected beams and their stray beams transmitting through a polarizing beam splitter 29 transmit through a focusing lens 32 to be made incident on a cylindrical lens (astigmatism generation means) 33. A photodetector 34 is irradiated with the beams converged by the lens 33 and their stray beams. The main beam detector 10 of the detector 34 focus-controls an objective lens 31 based on respective receiving light quantities of a main beam 7 with which light receiving areas 10A-10D are irradiated.

CLAIMS

[Claim(s)]
[Claim 1]An optical pickup device for multilayered optical disks for optical discs which carries out the plural laminates of the information signal layer characterized by comprising the following on which a desired information signal is recorded.
An astigmatism generating means which makes a reflective beam generate astigmatism.
A light-receiving means to output each light volume detecting signal according to each light-receiving light volume which received a reflective beam from the above-mentioned astigmatism generating means in each light-receiving field radiately quadrisected considering an optic axis of this reflective beam as a center, and received light in these each light-receiving field.
A detection means to detect an information signal layer with which the present focus is united based on each light volume detecting signal from each light-receiving field of the above-mentioned light-receiving means.

[Claim 2]It has each light-receiving field where a light-receiving field was radiately quadrisected considering an optic axis of a reflective beam from an information signal layer in which the present focus is put together as a center, The optical pickup device for multilayered optical disks according to claim 1, wherein it has a quadrisection photodetector which receives the above-mentioned reflective beam in these each light-receiving field, and each light-receiving field of the above-mentioned light-receiving means is located in a peripheral part of each light-receiving field of the above-mentioned quadrisection photodetector, respectively and is established in it.
[Claim 3]The above-mentioned quadrisection photodetector is formed in approximately rectangular shape, and each light-receiving field of the above-mentioned light-receiving means is formed in the shape of an abbreviated L character, and each these abbreviation L character-like light-receiving field, The optical pickup device for multilayered optical disks according to claim 2, wherein a folding point of each inside is provided so that it may be located on extension wire of a diagonal line of the above-mentioned quadrisection photodetector, respectively and each light-receiving field of this quadrisection photodetector may be surrounded, respectively.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application]this invention, for example, the plural laminates of the information signal layer which is a signal recording area were carried out, An information signal is used for the playback equipment, recorder, and recording and reproducing device which carry out record reproduction from each information signal layer of multilayered optical disks, such as a multilayered optical disk in which the information signal was recorded by the pit, and a multilayer magneto-optical disc to which magneto-optical recording of the information signal was carried out, and it is related with the suitable optical pickup device for multilayered optical disks.
[0002]
[Description of the Prior Art]The conventional optical pickup device comprises:
The laser diode which is a light source.
The collimating lens, the diffraction grating, polarization beam splitter, object lens which coincide an optic axis mutually and are provided between this laser diode and optical disc.
This optical pickup device comprises:
The photodetector which receives the laser beam (a reflective beam is called hereafter.) reflected from the optical disc through a polarization beam splitter.
The focusing glass which coincides an optic axis mutually and is provided between this photodetector and polarization beam splitter.

[0003]And this optical pickup device condenses and irradiates the signal recording area of an optical disc with the laser beam emitted from the laser diode via a polarization beam splitter, an object lens, etc. And by receiving the reflective beam from the optical disc through a polarization beam splitter by a photodetector, the information signal of an optical disc is read and it plays.
[0004]The focus control which carries out focus adjustment of the object lens with astigmatic method when this optical pickup device reads the information signal of an optical disc and it plays, Tracking control which follows the signal track of the signal recording area of an optical disc, and carries out tracking adjustment of the object lens by law 3 ********s (three beams) is performed.
[0005]
[Problem(s) to be Solved by the Invention]By the way, high recording density-ization of

the information signal is demanded and, as for the optical disc, the multilayered optical disk in which the plural laminates of the information signal layer which is a signal recording area were carried out is proposed.
[0006]There is a two-layer optical disc which the information signal layer which is an information signal record section is laid on top of two-layer for example, and is constituted in this multilayered optical disk. The disc substrate 20C generally formed with transparent synthetic resin materials, such as polycarbonate (PC) and polymethylmethacrylate (PMMA), as the two-layer optical disc 20 is shown in drawing 5, The 1st information signal layer 20A formed on the principal surface of this disc substrate 20C, The spacer layer 20D formed with a transparent resin material on this 1st information signal layer 20A, It comprises the 2nd information signal layer 20B piled up and formed in the 1st information signal layer 20A via the spacer layer 20D, and the protective layer 20E by which covering formation is carried out on the 2nd information signal layer 20B in order to protect mechanically and chemically this 2nd information signal layer 20B.
[0007]And as this two-layer optical disc 20 is shown in drawing 6, when the information signal of the 2nd information signal layer 20B laid on top of the 1st information signal layer 20A reads and is played by an optical pickup device, The laser beam 25 emitted from the laser diode is the structure which penetrates the 1st information signal layer 20A, and is irradiated by the 2nd information signal layer 20B.
[0008]When the conventional optical pickup device reads an information signal in the 1st information signal layer 20A of the two-layer optical disc 20 and is reproduced, as shown in drawing 7 (A), The laser beam 25 irradiated by the 1st information signal layer 20A will be irradiated by the 2nd information signal layer 20B that penetrates this 1st information signal layer 20A, and is not made into the object of reading of an information signal in the process irradiated by the 1st information signal layer 20A, respectively.
[0009]For this reason, while the reflective beam 25A from the 1st information signal layer 20A of the two-layer optical disc 20 in which the focus of the object lens 21 was united with the photodetector 23 is irradiated with an optical pickup device, It is irradiated also with the reflective beam 25B (the stray light of a reflective beam is called hereafter.) which carried out focal dotage and was enlarged from the 2nd information signal layer 20B with which the focus of the object lens 21 is not united. That is, the stray light 25B of the reflective beam which was able to be extended on the photodetector 23 via the focusing glass 22 at the periphery side of the reflective beam 25A and this reflective beam 25A is irradiated with an optical pickup device by concentric circle shape, respectively.
[0010]Similarly, when an optical pickup device reads an information signal in the 2nd information signal layer 20B of the two-layer optical disc 20 and is reproduced, as shown in drawing 7 (B), The laser beam 25 irradiated by the 2nd information signal layer 20B will be irradiated by the 1st information signal layer 20A that is not made into the object of reading of an information signal in the process irradiated by the 2nd information signal layer 20B, respectively.
[0011]For this reason, while the reflective beam 25A reflected from the 2nd information signal layer 20B of the two-layer optical disc 20 in which the focus of the object lens 21 was united with the photodetector 23 is irradiated with an optical pickup device, It is irradiated also with the stray light 25B of the reflective beam which carried out focal

dotage and was enlarged from the 1st information signal layer 20A with which the focus of the object lens 21 is not united.
[0012]By the way, when an optical pickup device reads the information signal of a multilayered optical disk, and is reproduced, and a crack, dust, etc. are on the signal recording area of a multilayered optical disk, for example, the detection defective ******** defect of an information signal generates it. For this reason, an optical pickup device shifts from the information signal layer of the multilayered optical disk in which the focus of the object lens 21 was put together, and there is a problem that the focus of the object lens 21 will be united with other information signal layers.
[0013]And when an optical pickup device detects with which information signal layer of the multilayered optical disk the focus of the object lens 21 is united, Based on the focus error signal produced by the focusing control performed in order to read the information signal of an information signal layer, the information signal layer with which the focus is united is detected.
[0014]That is, this optical pickup device has the problem that the information signal layer with which the focus was united is undetectable, once focusing control is performed and the focus of the object lens 21 is united with one information signal layer of the multilayered optical disks.
[0015]Therefore, when the focus shifted to other information signal layers and the optical pickup device has been set by them from the information signal layer with which the focus was united, The information signal layer with which the focus is united by shifting by once performing reading reproduction in the information signal from the information signal layer with which the focus was united by shifting must be detected.
[0016]For this reason, this optical pickup device has the problem that a required information signal cannot be read and it cannot reproduce, during the time which the corrective action which corrects the focus shifted takes, when a gap arises to a focus.
[0017]Then, this invention becomes possible [detecting the information signal layer with which the focus of the multilayered optical disk is united], and an object of this invention is to provide the optical pickup device for multilayered optical disks which can perform reading reproduction motion of a desired information signal promptly.
[0018]
[Means for Achieving the Goal]In order to attain the purpose mentioned above, an optical pickup device for multilayered optical disks concerning this invention is an object for optical discs which carries out the plural laminates of the information signal layer on which a desired information signal is recorded. And an astigmatism generating means which makes a reflective beam generate astigmatism, A light-receiving means to output each light volume detecting signal according to each light-receiving light volume which received a reflective beam from the above-mentioned astigmatism generating means in each light-receiving field radiately quadrisected considering an optic axis of this reflective beam as a center, and received light in these each light-receiving field, Based on each light volume detecting signal from each light-receiving field of the above-mentioned light-receiving means, it has a detection means to detect an information signal layer with which the present focus is united.
[0019]It has each light-receiving field where a light-receiving field was radiately quadrisected considering an optic axis of a reflective beam from an information signal layer in which the present focus is put together as a center, It has a quadrisection

photodetector which receives the above-mentioned reflective beam in these each light-receiving field, and each light-receiving field of the above-mentioned light-receiving means is located in a peripheral part of each light-receiving field of the above-mentioned quadrisection photodetector, respectively, and is established in it.
[0020]The above-mentioned quadrisection photodetector is formed in approximately rectangular shape, and each light-receiving field of the above-mentioned light-receiving means is formed in the shape of an abbreviated L character, and each these abbreviation L character-like light-receiving field, It provides so that a folding point of each inside may be located on extension wire of a diagonal line of the above-mentioned quadrisection photodetector, respectively and may surround each light-receiving field of this quadrisection photodetector, respectively, and it is ****.
[0021]
[Function]The optical pickup device for multilayered optical disks concerning this invention constituted as mentioned above, When reading an information signal in each information signal layer of a multilayered optical disk and playing, while an astigmatism generating means generates astigmatism from the information signal layer of a multilayered optical disk to a reflective beam, a light-receiving means receives the reflective beam from this astigmatism generating means.
[0022]By the way, in connection with the information signal layer of the multilayered optical disk by which the reflective beam from the information signal layer with which the focus is not united is reflected changing, the gestalt on the acceptance surface of a light-receiving means also changes. Therefore, the optical pickup device for multilayered optical disks detects the information signal layer with which the focus whose detection means is an object lens is united based on the light-receiving light volume which a light-receiving means receives according to change of the gestalt of the reflective beam from the information signal layer with which the focus is not united.
[0023]Namely, this optical pickup device for multilayered optical disks, a light-receiving means receives the reflective beam from the information signal layer of the multilayered optical disk in which the focus is not put together -- it becomes possible to detect the information signal layer with which the focus whose detection means is an object lens is united at any time based on each light volume detecting signal from each light-receiving field of this light-receiving means.
[0024]
[Example]The optical pickup device 1 for multilayered optical disks of the example which reads a two-layer optical disc as a multilayered optical disk, and is hereafter played about the concrete example of this invention is explained with reference to drawing 1 - drawing 3. This optical pickup device 1 for multilayered optical disks performs focusing control with astigmatic method while performing tracking control by the 3 spotting method.
[0025]The laser diode 26 which is a light source as the optical pickup device 1 for multilayered optical disks is shown in drawing 1, It has the collimating lens 27 which coincides an optic axis mutually and is provided between this laser diode 26 and the two-layer optical disc 20, the diffraction grating 28, the polarization beam splitter (PBS) 29, the 1/4 wavelength plate 30, and the object lens 31. This optical pickup device 1 for multilayered optical disks, It has the focusing glass 32 and the cylindrical lens 33 which coincide an optic axis mutually and are provided between the photodetector 34 which

receives the reflective beam from the two-layer optical disc 20, and this photodetector 34 and polarization beam splitter 29.
[0026]As shown in drawing 2, the photodetector 34 The main beam detector 10, The 1st side beam detector 11 and the 2nd side beam detector 12 which are provided in the both-sides end of this main beam detector 10, respectively, the [the 1st detector 13A for discernment provided in the peripheral part of the main beam detector 10 -] -- the [the detector 13D for discernment of four, the detector 13A for discernment of these 1st -] -- the detectors 18 by which connection wiring was carried out are consisted of by the detector 13D for discernment of four.
[0027]the main beam detector 10 centers on the optic axis of the reflective beam irradiated by the acceptance surface -- a light-receiving field -- radiate -- the [the 1st light-receiving field 10A -] -- the quadrisection photodetector of the approximately rectangular shape divided the 4th grade is used for the light-receiving field 10D of four. The 1st side beam detector 11 and the 2nd side beam detector 12, 2 division photodetector by which the light-receiving field was divided into the 1st light-receiving field 11A and 12A and the 2nd light-receiving field 11B and 12B the 2nd grade is used by the straight line which passes along the optic axis of the reflective beam irradiated by the acceptance surface. And the 1st side beam detector 11 and the 2nd side beam detector 12 are located in a way outside the stray light 14 of the main beam irradiated by the main beam detector 10, and are provided, respectively.
[0028]the [the 1st detector 13A for discernment -] -- as for the detector 13D for discernment of four, each light-receiving field is formed in the shape of an abbreviated L character. and -- while the folding point of each inside is located on the extension wire of main beam detector 10 diagonal line, respectively in each these L character-like light-receiving field -- the [the 1st light-receiving field 10A of the main beam detector 10 -] -- it is allocated in the state of surrounding the light-receiving field 10D of four, respectively, respectively.
[0029]the detector 18 is shown in drawing 3 -- as -- the [the 1st detector 13A for discernment -] -- connection wiring is carried out at the detector 13D for discernment of four, respectively.
the [the detector 13A for discernment of these 1st -] -- based on each light volume detecting signal outputted to the detector 13D for discernment of four, the information signal layer with which the focus of the object lens 31 is united is detected.

[0030]And the two-layer optical disc 20 which reads as a multilayered optical disk to the optical pickup device 1 for multilayered optical disks, and is played, The disc substrate 20C generally formed with transparent synthetic resin materials, such as polycarbonate (PC) and polymethylmethacrylate (PMMA), as shown in drawing 5 (A) and drawing 5 (B), The 1st information signal layer 20A formed on the principal surface of this disc substrate 20C, The spacer layer 20D formed with a transparent resin material on this 1st information signal layer 20A, It comprises the 2nd information signal layer 20B piled up and formed in the 1st information signal layer 20A via the spacer layer 20D, and the protective layer 20E by which covering formation is carried out on the 2nd information signal layer 20B in order to protect mechanically and chemically this 2nd information signal layer 20B.
[0031]And as this two-layer optical disc 20 is shown in drawing 6, when the information

signal of the 2nd information signal layer 20B laid on top of the 1st information signal layer 20A by the optical pickup device is read, The laser beam emitted from the laser diode is the structure which penetrates the 1st information signal layer 20A, and is irradiated by the 2nd information signal layer 20B.
[0032]About the optical pickup device 1 for multilayered optical disks constituted as mentioned above. When reading an information signal in the 1st information signal layer of the two-layer optical disc 20 and playing, the processing which detects the information signal layer with which the optical path of the laser beam emitted from the laser diode 26 and the focus of the two-layer optical disc 20 are united is explained with reference to drawing 3.
[0033]First, the laser beam emitted from the laser diode 26 enters into the collimating lens 27, and is changed and emitted to a parallel beam by this collimating lens 27 from sending light. The laser beam emitted to the collimating lens 27 enters into the diffraction grating 28.
[0034]This diffraction grating 28 trichotomizes and penetrates the laser beam which entered to the main beam 7, the 1st side beam 8, and the 2nd side beam 9. Each beam trichotomized by the diffraction grating 28 enters into the polarization beam splitter 29, and is penetrated by this polarization beam splitter 29.
[0035]Each beam which entered into the 1/4 wavelength plate 30, and entered with this 1/4 wavelength plate 30 is changed into circular light from linear polarization, respectively, and each beam penetrated by the polarization beam splitter 29 is penetrated. Each beam penetrated by the 1/4 wavelength plate 30 enters into the object lens 31.
[0036]This object lens 31 condenses each beam which entered, respectively, and irradiates the 1st information signal layer 20A of the two-layer optical disc 20 with it. It penetrates the 1st information signal layer 20A, and it is irradiated with it by the 2nd information signal layer 20B while being irradiated with each beam irradiated by the 1st information signal layer 20A of the two-layer optical disc 20 at this time by this 1st information signal layer 20A.
[0037]And while each beam irradiated by the 1st information signal layer 20A of the two-layer optical disc 20 is reflected from this 1st information signal layer 20A, each beam is reflected also from the 2nd information signal layer 20B. Namely, each beam irradiated by the 1st information signal layer 20A of the two-layer optical disc 20, It becomes the stray light of each reflective beam from the 1st information signal layer 20A with which the focus of the object lens 31 is united, and each reflective beam from the 2nd information signal layer 20B with which the focus of the object lens 31 is not united, and is reflected.
[0038]And the stray light of each reflective beam and each reflective beam enters into the object lens 31, respectively. This object lens 31 makes the stray light of each reflective beam which entered, and each reflective beam penetrate, respectively, and is entered in the 1/4 wavelength plate 30, respectively. This 1/4 wavelength plate 30 changes the stray light of each reflective beam which entered, and each reflective beam into linear polarization from circular light, respectively, and makes it penetrate.
[0039]The stray light of each reflective beam penetrated by the 1/4 wavelength plate 30 and each reflective beam enters into the polarization beam splitter 29, and it is reflected by this polarization beam splitter 29, respectively, and it is penetrated. The stray light of each reflective beam which penetrated the polarization beam splitter 29, and each

reflective beam enters into the focusing glass 32, and is converged and penetrated by this focusing glass 32.
[0040]The stray light of each reflective beam which penetrated the focusing glass 32, and each reflective beam enters into the cylindrical lens 33. It is condensed, respectively and the stray light of each reflective beam which entered into this cylindrical lens 33, and each reflective beam is irradiated on each detector of the photodetector 34, respectively.
[0041]the main beam detector 10 of the photodetector 34 -- the [the 1st light-receiving field 10A -] -- focusing control of the object lens 31 is carried out with each light-receiving light volume of the main beam 7 irradiated by the light-receiving field 10D of four. the main beam detector 10 -- the [the 1st light-receiving field 10A -], if the light volume detect output outputted by the light-receiving field 10D of four is set to E1, E2, E3, and E4, respectively, What is called a focus error signal (FE) that shows the focal discrepancy in the surface of the 1st information signal layer 20A of the two-layer optical disc 20 is FE=(E1+E3)- (E2+E4).
It can be alike and can obtain more.
[0042]The 1st side beam detector 11 of the photodetector 34 and the 2nd side beam detector 12, Tracking control of the object lens 31 is carried out with each light-receiving light volume of the 1st side beam 8 and the 2nd side beam 9 irradiated by the 1st light-receiving field 11A and the 2nd light-receiving field 11B, and the 1st light-receiving field 12A and the 2nd light-receiving field 12B.
[0043]The 1st side beam detector 11 and the 2nd side beam detector 12, If the light volume detect output outputted by the 1st light-receiving field 11A and the 2nd light-receiving field 11B, the 1st light-receiving field 12A, and the 2nd light-receiving field 12B is set to E5, E6, E7, and E8, respectively, What is called a tracking error signal (TE) that shows the track discrepancy in the surface of the 1st information signal layer 20A of the two-layer optical disc 20 is TE=(E5+E6)- (E7+E8).
It can be alike and can obtain more.
[0044]And the main beam detector 10, the 1st side beam detector 11, and the 2nd side beam detector 12, While the main beam 7, the 1st side beam 8, and the 2nd side beam 9 are irradiated from the 1st information signal layer 20A, respectively, The stray light 14 of a main beam, the stray light of the 1st side beam that is not illustrated, and the stray light of the 2nd side beam are irradiated from the 2nd information signal layer 20B, respectively.
[0045]The stray light 14 of the main beam irradiated by the main beam detector 10, Since the 1st side beam detector 11 and the 2nd main beam detector 12 set a predetermined interval and are provided from the main beam detector 10, it is not superimposed, respectively on the 1st side beam detector 11 and the 2nd side beam detector 12. Although the stray light of the 1st side beam and the stray light of the 2nd side beam do not illustrate, it is not superimposed on them on the main beam detector 10.
[0046]Temporarily, even if the stray light of these 1st side beams and the stray light of the 2nd side beam are the cases where it is superimposed on the main beam detector 10, since it is weak enough as compared with the stray light 14 of a main beam, intensity does not have an adverse effect on the main beam detector 10.
[0047]And as shown in drawing 2 and drawing 3, in order to carry out focusing control of the optical pickup device 1 for multilayered optical disks with astigmatic method, spot form of the stray light 14 of a main beam is made elliptical. By whether it is reflected

from the 1st information signal layer 20A of the two-layer optical disc 20, or it is reflected from the 2nd information signal layer 20B, an elliptical major axis and minor axis interchange and the stray light 14 of this main beam changes.
[0048]Namely, this optical pickup device 1 for multilayered optical disks, As shown in drawing 2 and drawing 3, when the information signal layer made into the object of reading playback of an information signal is the 2nd information signal layer 20B of the two-layer optical disc 20, The stray light 14 of a main beam is reflected from the 1st information signal layer 20A (side [it is near to the object lens 31]), and the elliptical major axis which is the stray light 14 of this main beam inclines 45 degrees on the right.
[0049]This optical pickup device 1 for multilayered optical disks, As shown in drawing 2 and drawing 3, when the information signal layer made into the object of reading playback of an information signal is the 1st information signal layer 20A of the two-layer optical disc 20, The stray light 14 of a main beam is reflected from the 2nd information signal layer 20B (side [it is far to the object lens 31]), and the elliptical major axis which is the stray light 14 of this main beam inclines 45 degrees on the left.
[0050]the [therefore, / the 1st detector 13A for discernment -] -- the light-receiving light volume in which each light-receiving field receives the detector 13D for discernment of four, respectively when elliptical [of the stray light 14 of a main beam] changes changes. the [the detector 13A for discernment of these 1st -] -- the detector 13D for discernment of four outputs each light volume detecting signal of each light-receiving field, and the detector 18 detects the information signal layer with which the focus of the object lens 31 is united based on these each light volume detecting signal.
[0051]the [the 1st detector 13A for discernment -] -- the detector 13D for discernment of four makes the light volume detect output outputted by each light-receiving field S1, S2, S3, and S4. And the detecting signal (LS) which detects the information signal layer of the two-layer optical disc 20 in which the focus of the object lens 31 is put together is LS=(S1+S3)- (S2+S4).
It can be alike and can obtain more.
[0052]And the optical pickup device 1 for multilayered optical disks is the 1st information signal layer 20A, when reading the information signal of the two-layer optical disc 20 as a multilayered optical disk, playing and the information signal layer with which the focus of the object lens 31 is united by the detector 18 is LS>0.
In the case of LS<0, it detects that it is the 2nd information signal layer 20B.

[0053]Next, about the optical pickup device 1 for multilayered optical disks mentioned above. the time of reading the three-layer optical disc which is not illustrated as a multilayered optical disk, and playing -- the [the 1st detector 13A for discernment -] -- the detector 13D for discernment of four explains the processing which detects the information signal layer with which the focus of the object lens 31 is united with reference to drawing 4 (A) - drawing 4 (C).
[0054]First, the optical pickup device 1 for multilayered optical disks, When reading an information signal in the 1st information signal layer (side nearest to the object lens 31) of a three-layer optical disc and playing, as shown in drawing 4 (A), the [the 1st detector 13A for discernment -] -- concentric circle shape is overlapped on the stray light 14B of the reflective beam from the 2nd information signal layer and the stray light 14C of the reflective beam from the 3rd information signal layer by which the focus of the object

lens 31 is not united with the detector 13D for discernment of four, respectively.
[0055]The stray light 14B of the reflective beam from the 2nd information signal layer and the stray light 14C of the reflective beam from the 3rd information signal layer are elliptical [toward which the major axis inclined 45 degrees on the right, respectively].
The stray light 14C of the reflective beam from the 3rd information signal layer is formed in the concentric circle shape which was able to be extended to the peripheral part of the stray light 14B of the reflective beam from the 2nd information signal layer.
[0056]Next, the optical pickup device 1 for multilayered optical disks, When reading an information signal in the 2nd information signal layer of a three-layer optical disc and playing, as shown in drawing 4 (B), the [the 1st detector 13A for discernment -] -- it is superimposed on the stray light 14A of the reflective beam from the 1st information signal layer and the stray light 14C of the reflective beam from the 3rd information signal layer by which the focus of the object lens 31 is not united with the detector 13D for discernment of four, respectively.
[0057]The stray light 14A of the reflective beam from the 1st information signal is elliptical [toward which the major axis inclined 45 degrees on the left].
The stray light 14C of the reflective beam from the 3rd information signal layer is elliptical [toward which the major axis inclined 45 degrees on the right].
The stray light 14A of the reflective beam from the 1st information signal layer intersects the stray light 14C of the reflective beam from the 3rd information signal layer.
[0058]And the optical pickup device 1 for multilayered optical disks, When reading an information signal in the 3rd information signal layer (furthest side from the object lens 31) of a three-layer optical disc and playing, as shown in drawing 4 (C), the [the 1st detector 13A for discernment -] -- concentric circle shape is overlapped on the stray light 14A of the reflective beam from the 1st information signal layer and the stray light 14C of the reflective beam from the 2nd information signal layer by which the focus of the object lens 31 is not united with the detector 13D for discernment of four, respectively.
[0059]The stray light 14A of the reflective beam from the 1st information signal layer and the stray light 14B of the reflective beam from the 2nd information signal layer are elliptical [toward which the major axis inclined 45 degrees on the left, respectively].
The stray light 14A of the reflective beam from the 1st information signal layer is formed in the concentric circle shape which was able to be extended to the peripheral part of the stray light 14B of the reflective beam from the 2nd information signal layer.
[0060]Namely, the optical pickup device 1 for multilayered optical disks, When reading an information signal in each information signal layer of a three-layer optical disc and playing, responding to the information signal layer with which the focus of the object lens 31 is united -- the [the 1st detector 13A for discernment -] -- the state where the detector 13D for discernment of four is overlapped on the stray lights 14A, 14B, and 14C of the reflective beam from each information signal layer, respectively changes.
[0061]Therefore, the optical pickup device 1 for multilayered optical disks, the [the 1st detector 13A for discernment -] -- each light-receiving field of the detector 13D for discernment of four outputs each light volume detecting signal according to each light-receiving light volume, and when the detector 18 detects based on these each light volume detecting signal, the information signal layer with which the focus of the object lens 31 is united is detected.
[0062]it mentioned above -- as -- the optical pickup device 1 for multilayered optical

disks of an example -- the [the 1st detector 13A for discernment -] -- the information signal layer with which the focus of the object lens 31 was united if needed is detectable at any time by having the detector 13D for discernment of four.
[0063]Therefore, this optical pickup device 1 for multilayered optical disks, When the information signal of a multilayered optical disk is read and a crack, dust, etc. are on the signal recording area of a multilayered optical disk during playback, for example, Even when a focus shifts from the information signal layer with which the focus of the object lens 31 was united and the focus has been united with other information signal layers, the corrective action which returns a focus can carry out to the information signal layer of the origin with which the focus was united promptly.
[0064]That is, even when a gap arises in the focal position of the object lens 31, the optical pickup device 1 for multilayered optical disks performs the corrective action of a focal position promptly, can read a desired information signal promptly and can be played.
[0065]Although the pickup 1 for multilayered optical disks of the example was provided with the polarization beam splitter 29, by using a beam splitter instead of this polarization beam splitter 29, it becomes unnecessary [the 1/4 wavelength plate 30], and can simplify composition.
[0066]Although the pickup 1 for multilayered optical disks concerning this example detected the tracking error signal by the 3 spotting method, it is not limited to the 3 spotting method and may detect a tracking error signal by other push pull methods, a heterodyning technique, etc., for example.
[0067]the [the 1st detector 13A for discernment -] -- a light-receiving field may constitute the detector 13D for discernment of four from a quadrisection photodetector divided the 4th grade radiately. In this case, the optical pickup device 1 for multilayered optical disks, Had the beam splitter which divides into two the reflective beam reflected in the polarization beam splitter 29, and while was divided by this beam splitter, and while making the main beam detector 10 irradiate with a reflective beam, It has composition which makes the reflective beam of divided another side generate astigmatism, and makes it irradiate a quadrisection photodetector with this reflective beam with the cylindrical lens 33.
[0068]the [the 1st detector 13A for discernment in which the optical pickup device 1 for multilayered optical disks of an example has an abbreviated L character-like light-receiving field -], although it had the detector 13D for discernment of four, and the main beam detector 10 of approximately rectangular shape, the [the 1st detector for discernment that has a light-receiving field of an approximate circle arc -] -- the [the detector for discernment of four, the detector for discernment of these 1st -] -- it is good also as composition provided with the main beam detector of the circle configuration with which a peripheral part is surrounded by the detector for discernment of four.
[0069]the last -- the optical pickup device 1 for multilayered optical disks of an example -- the [the 1st detector 13A for discernment -], although the detector 13D for discernment of four was formed independently, respectively, By providing the detector for discernment which has an approximately rectangle annular light-receiving field in the peripheral part of the main beam detector 10, and dividing the light-receiving field of this detector for discernment the 4th grade corresponding to each light-receiving field of the main beam detector 10, the [the 1st detector 13A for discernment -] -- the detector 13D

for discernment of four may be constituted.
[0070]
[Effect of the Invention]The astigmatism generating means which makes a reflective beam generate astigmatism according to the optical pickup device for multilayered optical disks concerning this invention, A light-receiving means to output each light volume detecting signal according to each light-receiving light volume which received the reflective beam from the above-mentioned astigmatism generating means in each light-receiving field radiately quadrisected considering the optic axis of this reflective beam as a center, and received light in these each light-receiving field, The information signal layer with which the focus is united if needed is detectable at any time by having a detection means to detect the information signal layer with which the present focus is united, based on each light volume detecting signal from each light-receiving field of the above-mentioned light-receiving means.
[0071]Therefore, even when the information signal layer with which the focus is united shifts for example, and the focus has been united with other information signal layers, this optical pickup device for multilayered optical disks performs the corrective action of a focal position promptly, can read a desired information signal promptly and can be played.

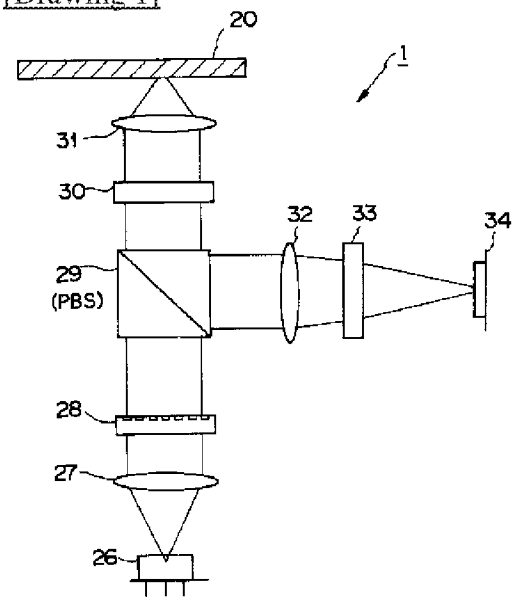
[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

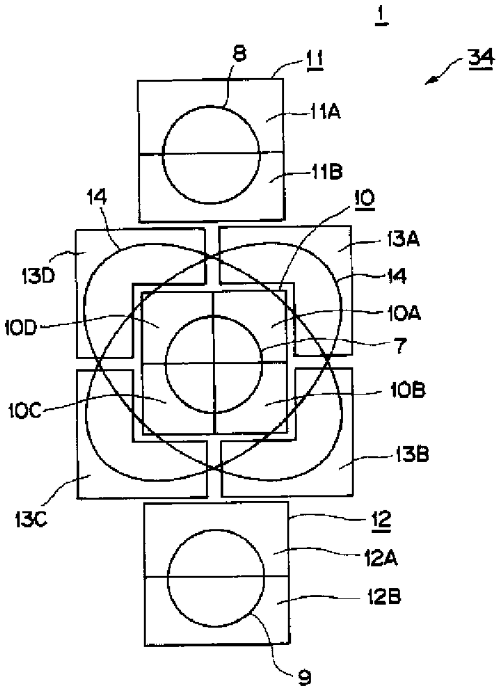
DRAWINGS

[Drawing 1]



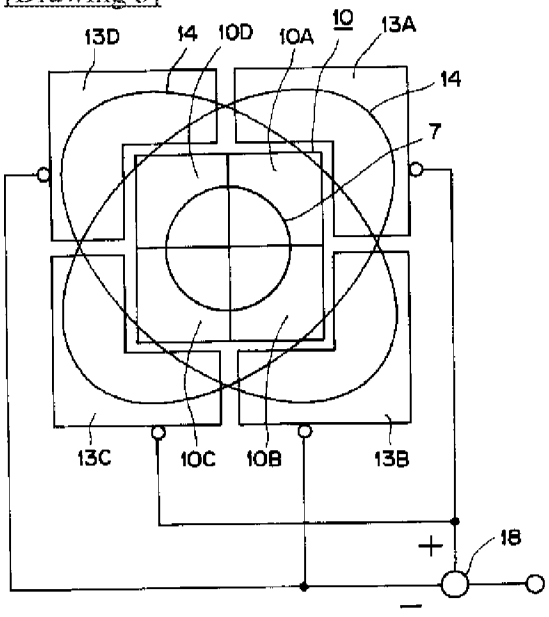
第1の実施例多層光ディスク用光ピックアップ装置の模式図

[Drawing 2]



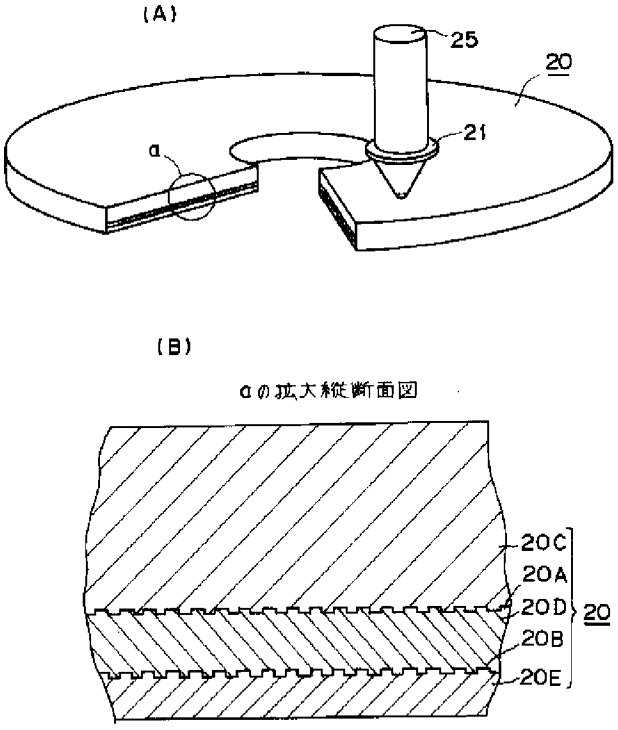
第1の実施例多層光ディスク用光ピックアップ装置が備えるフォトディテクタの平面模式図

[Drawing 3]



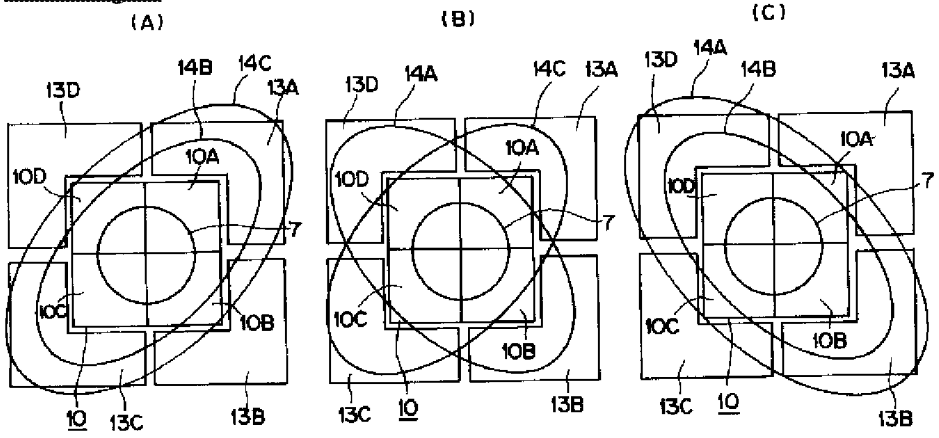
第1の実施例多層光ディスク用光ピックアップ装置が備えるフォトディテクタのメインビームディテクタの平面模式図

[Drawing 5]



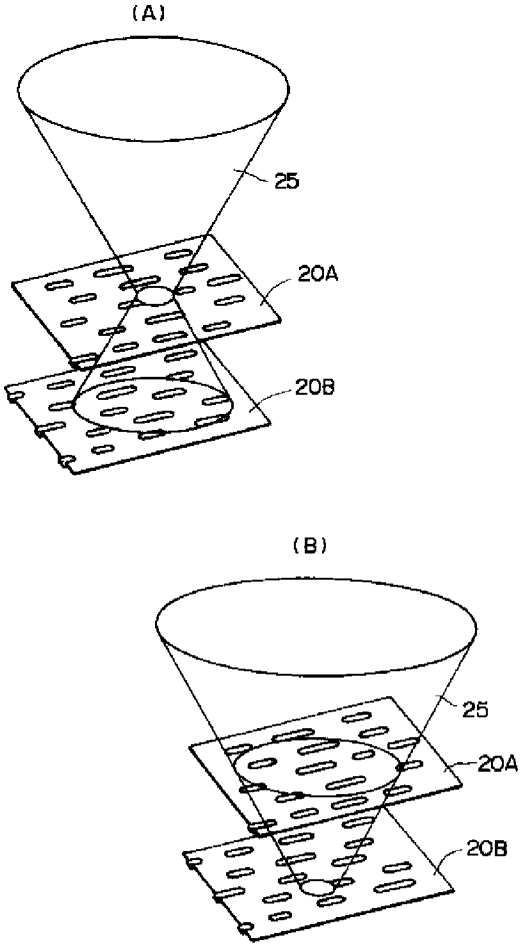
2層光ディスクの部分拡大斜視図

[Drawing 4]



第1の実施例多層光ディスク用光ピックアップ装置が備えるフォトディテクタのメインビームディテクタと識別用ディテクタとを示す平面模式図

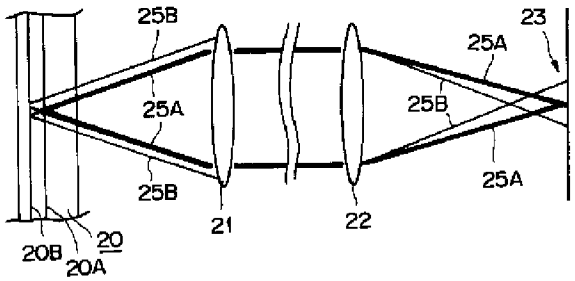
[Drawing 6]



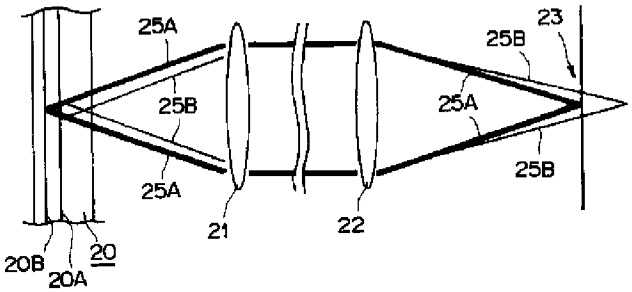
従来の光ピックアップ装置が２層光ディスクにレーザビームを照射した状態を説明するための模式図

[Drawing 7]

(A)



(B)



従来の光ピックアップ装置が２層光ディスクに照射した
レーザビームの光路を説明するための模式図

[Translation done.]